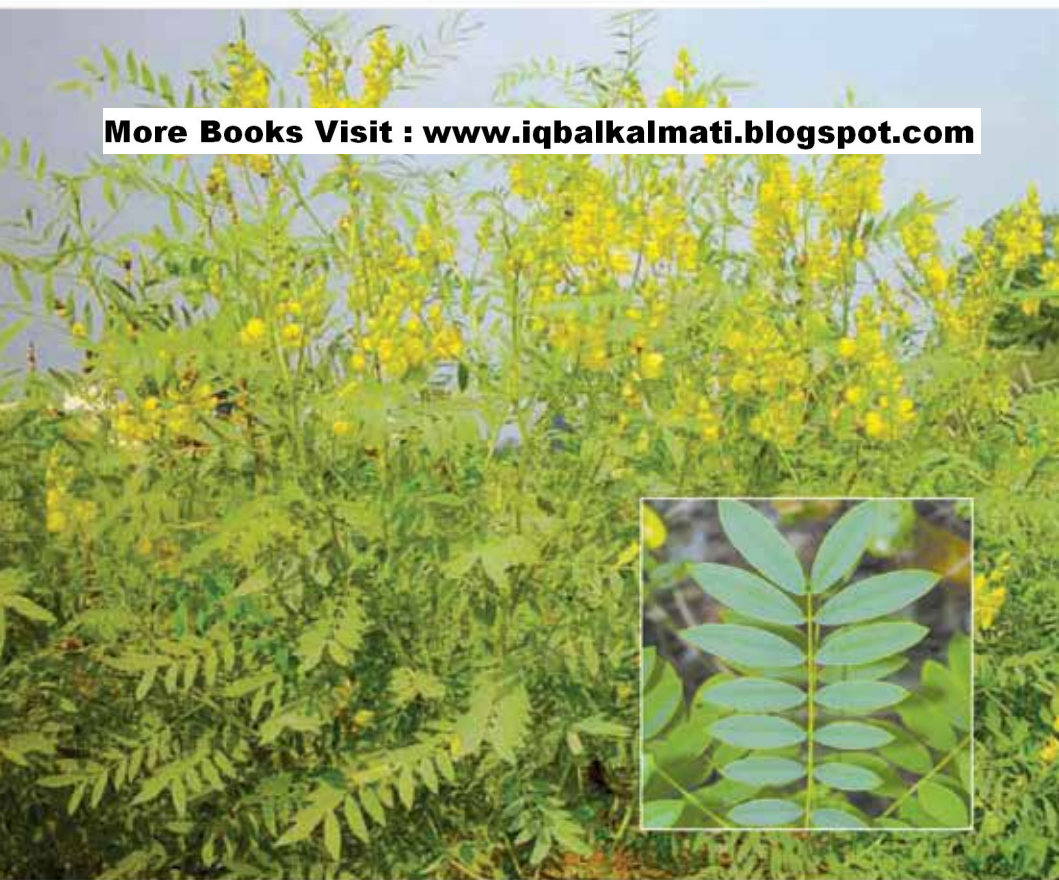


Good Agricultural Practices for Senna

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ICAR – DIRECTORATE OF MEDICINAL AND AROMATIC PLANTS RESEARCH
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Good Agricultural Practices **for** **Senna**

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Printed : March, 2015

Front Cover :



Senna plant



Senna leaf

Printed at : Anand Press, Anand 388 001, Gujarat

E-mail : anandpress@gmail.com

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FOREWORD

Medicinal plants are wonder gift of nature which are used as medicine, cosmetics, health hygiene and food supplements in improving the quality of life. Most of the world's supply of medicinal herbs is from the wild collection not by cultivation. This resulted into dwindling natural resources, reduced biodiversity and irregular supply. Cultivation of medicinal plants ensures sustainability and uniformity of the plant material thus, ensuring quality of raw drugs. Compliance of good agricultural practices (GAP) for cultivation of medicinal crops is necessary to produce good quality raw drugs.

Senna (Cassia angustifolia) is a perennial 1-2 m height tropical undershrub. It is commercially cultivated in semi-arid regions of Tamil Nadu, Rajasthan and Gujarat. India is the largest producer and exporter of senna leaves, pods and total sennosides in the world market. Primarily, Senna leaves are used as natural laxative to treat constipation. It is also useful in the treatment of gonorrhoea, skin diseases, dyspepsia, fevers and haemorrhoids.

I am happy that ICAR- DMAPR, Anand has taken an initiative in compiling and publishing this extension bulletin that would serve as useful guide to the senna cultivators for the production of better yield and quality raw material.


(Jitendra Kumar)

Anand

Date: 24-11-2014

Good Agricultural Practices for Senna



1. Name of the plant

1.1 **Scientific name:** *Cassia angustifolia* Vahl.

1.2 **Local name:**

English: Indian senna, Tinnevelly senna

Hindi: Senna, Sana ka patt, Sonamukhi

Sanskrit: Swarn patri, Sanai

Tamil: Nilavarai, Nelavakari

2. Plant parts used for medicinal purpose

Senna leaves and pods both are used for medicinal uses.

3. Uses

Arabians physicians as early as in the 9th century A.D. were using senna as medicine and presently it is used in Allopathic, Ayurvedic and Unani system of medicines. Primarily, senna leaves are used as natural laxative to treat constipation. They act on the large intestine to stimulate peristalsis (the muscular activity of the colon leading to elimination). It is known that several countries utilize the leaves of different indigenously available species for the same purpose. The two most widely exported and officially recognized species of seena are *C. acutifolia* and *C. angustifolia*. Senna also used as an expectorant, a wound dressing, an antidysenteric, and a carminative agent. It is useful in the treatment of gonorrhoea, skin diseases, dyspepsia, fevers and haemorrhoids. The herb is used in the form of crude plant material or powder as oral infusion or extracts (liquid or solid). It is always advised to use the drug under the supervision of Physician, because the excess use of senna may have adverse effect leading to sudden and intense stomach pains and colic or abdominal pains.

4. Characteristics of the plant

Senna, *Cassia angustifolia* is a perennial 1-2 m height undershrub. The stem is erect, smooth, and pale green to light brown with long spreading ascending branches. Leaves are compound with four to eight pairs of leaflets. The full grown leaflets are bluish-green to pale-green in colour and emit a characteristic fetid smell when crushed. The flowers are small and yellow and axillary arranged racemes. The pods are broadly oblong about 5-8 cm long and 2-3 cm broad, green in beginning and change to greenish-brown to dark brown on maturity. Each pod has 5 to 7 ovate, compressed, smooth, dark-brown seeds.



5. Major production areas

The plant is indigenous to tropical Africa. It grows wild near the Nile river, Arabian peninsula, India and Somalia. *Cassia angustifolia* reportedly introduced first in Tirunelveli district in Tamil Nadu during the mid eighteenth century from European countries and hence referred as Tinnevelly Senna. Now, it is grown in several

places in Tamil Nadu including Thirunelveli and Ramanathapuram Districts. Apart from Tamil Nadu, senna is also being cultivated in Maharashtra, Gujarat and Rajasthan.

6. Cultivation methods

6.1 Climate

Senna is usually cultivated as rain fed dry crop and very rarely as irrigated crop in certain areas. It is a deep rooted hardy plant and demands all around warm and dry weather conditions. The plant requires bright sun shine and occasional rains during its growth period. It is highly sensitive to heavy rainfall and water logging conditions. The crop cannot survive in water logging condition even for a day. An average rainfall of 25-40 cm distributed from June-October is sufficient to harvest good leaf yield of senna.

6.2 Soil

The crop thrives well on a variety of soils but, largely cultivated on sandy loam, red loam, alluvial loam soils. Senna is also cultivated successfully on black cotton soils. It has a great tolerance to high soil salinity, however, shedding of some lower leaves often occurs. The soil pH suited for cultivation is 7.0-8.5. But, the most suitable to sandy loam to loam soils which are more friable and well drained.

6.3 Land preparation

Senna does not require fine tilth. However, weeds and pebble free land is desirable. The field is ploughed once, harrowed once or twice and levelled. The whole field is subdivided in plots of suitable size, considering the slope of the land to facilitate drainage of excess water. Apply 10-15 tonne farm yard manure per hectare at the time of last ploughing and mix with the soil.

6.4 Sowing time

Generally, two sowing seasons are recognized in northern India; for irrigated crop- February to March, and for rain fed crop- July to November. Seeds are sown soon after receiving first monsoon showers for rain fed crop. Delay in sowing time considerably reduces vegetative growth phase in areas where winter sets by the

end of October and as a result subsequent foliage yield is drastically reduced. However, in South India, crop is sown in the month of September-October under residual soil moisture after harvesting of paddy, cotton and sorghum.

6.5 Method of Sowing

Broadcasting is the common method followed by the farmers for sowing of senna. However, line sowing with 45×30 cm row to row and plant to plant spacing produced maximum yield in Western India. The line sowing also facilitates intercultural operations. Seeds should be placed at a depth of 1-2 cm in soil for uniform germination. One light irrigation immediately after sowing should be given which improves germination up to 90% and maintains proper plant stand.

6.6 Propagation material

The crop is raised from seeds. Seeds have a hard seed coat hence abrading of its surface is necessary for quick germination. Soaking of seeds for 10-12 hours before sowing is reported to give 100% germination and even crop stand.

6.7 Recommended varieties

ALFT-2 is a late flowering and higher foliage yielding variety has major area in the country under senna cultivation. Tinnevelly senna- a semi spreading type, is popular in Tamil Nadu, and the variety KKM-Se 1 is also being cultivated in Tamil Nadu. Sona variety is grown in some parts of Rajasthan and Gujarat. The varieties of senna and their source of seed availability is given below.

Variety	Source of availability
ALFT-2	AICRP on Medicinal and Aromatic Plants, Anand Agricultural University, Anand, Gujarat
Tinnevelly Senna	Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
Sona	Central Institute for Medicinal and Aromatic Plants, Lucknow, Uttar Pradesh
KKM-Se1	Agriculture College and Research Institute, Killikulam, Tamil Nadu

6.8 Seed rate

Bold, disease free and mature seeds should be used for sowing of senna. About 15 kg seeds per hectare in irrigated condition and about 25 kg seeds per hectare in rain fed condition are required when sown through broadcasting. Seed rate can drastically be reduced if the crop is grown as line sowing under irrigated condition. About 6 kg seeds per hectare is found sufficient for optimum plant stand when sown by dibbling in the lines. For quick germination, the surface of seeds should be abraded by rubbing with coarse sand and soaking in water for 3 hours and mixed with natural manures before sowing. Seed treatment with Thiram at 3g per kg seed is recommended to avoid seedling diseases.

6.9 Crop nutrition:

In most cases, the crop is grown economically by utilizing residual nutrients of previous crop. However, application of FYM at 10 tonne per hectare at the time of land preparation and application of 50-60 kg nitrogen, 40 kg phosphorus and 20 kg potassium per hectare as basal under irrigated condition found optimum to harvest good crop. Foliar application of nitrogen increases biomass and total sennoside A + B yield per plant, however, the sennoside concentration (%) decreases in the plant. Hence, split application of nitrogen is advisable depending upon availability of irrigations. Fertilizer applications need to be coincided with rain for rain fed crop. In the international market organically grown senna leaves fetches premium price. Therefore, farmers are advised to follow organic nutrient and pest management, and get certification of organically grown senna for better returns.

6.10 Irrigation

Senna is grown usually as rain fed crop and in some areas it is grown under residual soil moisture conditions. Therefore, in majority of areas senna is grown without irrigation or with limited irrigation facilities. Under limited irrigation conditions the land is ploughed twice during February-March and divided into suitable size beds for facilitating irrigation. However, where crop is grown under full irrigated condition, two irrigations are very critical, one immediately after sowing and one at 30 days after sowing if soil moisture is inadequate. The crop benefits from light irrigation but does not stand

under continuous rain, water logging or heavy irrigation. About 5-8 irrigations are enough for good crop under irrigated conditions.

6.11 Intercultural operations and weeding

The growth of senna is very slow at initial stages and facilitates the growth of weeds. Once the plants attain 20-25 cm height, they are capable to suppress weed growth. However, two intercultural operations are sufficient for this crop. One weeding, thinning and hoeing operation at 25-30 days after sowing and one weeding-cum-hoeing operation at 90 days after sowing are sufficient.

6.12 Crop rotation

Senna under silvi-herbal system with different tree species in hot arid region of India perform very well, produce significantly higher yield and gives more returns. Senna as intercrop provides support to the farming system by way of conferring stability and generating assured income. Senna fits well in crop rotation as *kharif* crop in commercially cultivated areas. In Southern India, it is grown after paddy, cotton and sorghum, and in North as well as in Western India, senna is followed by mustard, chickpea or coriander.

6.13 Insect pests and disease management

6.13.1 Diseases

In northern and western India, this crop is reported to suffer from damping-off disease when it is grown in poorly drained soils. The best method of managing this disease is to improve drainage condition by allowing proper slope in the field. Seed treatment with Thiram at 3g per kg seeds is also beneficial. Leaf spot and leaf blight are the two occasionally most serious diseases of this crop. Cloudy and humid weather conditions are conducive for the spread of these diseases. In case of severe infestation, leaves start drying and falling causing severe yield loss. Pods are also affected in advanced stage of disease development. Two to three sprayings of Dithane M-45 at 0.15% at fortnightly interval keep the diseases under check. The crop should be harvested 25-30 days after spray of pesticides.

6.13.2 Insect pests

Occasional, severe damage of foliage has been observed due to white butterfly, which can be minimized by sowing the crop in the month

of March-April. The larvae of several caterpillars feed on the leaves and remain active from July-October. In nature, they are found to be heavily parasitized by *Trichogramma chilonis*. Release of *T. chilonis* at 150 thousand populations per hectare per week at the adult stage coinciding with the egg laying of the pest is a very effective method of this pest management.

6.14 Harvesting

Senna flowers in about 2 months after sowing and the first flush of flowering stalks should be removed to encourage a higher degree of vegetative growth. Harvesting is done by plucking the leaves when leaves are fully grown, thick and bluish in colour. Three harvestings are advised to get maximum leaf yield when crop is grown under irrigated condition. The first harvest is usually done 90 days after sowing and subsequently second and third harvests at 150 and 210 days after sowing. Under rain fed condition, cutting or uprooting of whole plants after 4-5 months is practiced for harvesting. The pods are harvested a little before maturity to maintain their green colour. For seed production, pods are collected during the month of February-March when the colour of the pods turns brown. Seeds from such harvest have high germination percentage.

7. Post harvest processing

The harvested leaves and pods are spread on a clean floor in open sun for 6-10 hours to reduce the moisture level. Thereafter, shade drying is suggested in well ventilated room with regular stirring to maintain light green to yellowish green colour of dry leaves. Pods are collected and dried, and seeds are separated by beating pods with sticks. Then leaves are stripped manually by beating on the floor and stalks or stems are separated. Using mechanical air blower the leaves, pods and other pebbles are separated. Then grading should be done and separate the large leaves and bold pods with yellowish green in colour to fetch premium price in the market. Next grade of the produce is leaves and pods having brownish colour. Lowest grade in commerce is small and broken one leaves and pods. In



Leaves



Pods

general, mature leaves containing 2.0 to 2.5% and pods containing 2.5 to 3.0% of sennosides are acceptable to the industry. The leaves after proper drying, grading and packing are to be stored in cool and dry place. Pressing of leaves and pods are done using hydraulic pressure to reduce the volume for transportation.



Seeds

8. Documentation of activities

The documentation of all the activities starting from cultivation to post harvest processing should be in continuation and maintained properly. Records should be kept for each activity of cultivation such as sowing, weeding, irrigation, harvesting, and of post-harvest processing after harvest to sorting, drying, grading, packing and storage, with details of time and type of activity that refers to a complete history and ensures traceability of the final product.

9. Yield and economics

On an average about 600-700 kg dry leaves and 300 kg pods per hectare under rain fed condition and about 1500-2000 kg dry leaves and 800 kg pods per hectare in irrigated condition can be harvested. Cultivation of senna cost ₹8,000/- and gives ₹20,000/- net profit per hectare under rain fed conditions and ₹45,000/- under irrigated conditions.

10. Marketing

Senna is cultivated commercially in Tamil Nadu, Rajasthan and Gujarat in about more than one lakh hectare area in semi-arid regions. India is the largest producer and exporter of senna leaves, pods and total sennosides in the world market. Sale price of leaves are ₹20 and pods are ₹40 per kg. The market prices are highly fluctuating year to year.

11. Market demand

Senna is a natural product used as laxative since ages and have a great domestic and international demand. Germany, Hungary, Japan, Neetharland and USA are the major markets of senna. However, to sustain the global market share, special efforts by way of Research and Development and Product application has to be initiated for senna and its extracts. India exports senna leaves and pods and there is a continuous rise in the export from ₹24 crore in the year 2005-06 to ₹47 crore in 2009-10.

12. Crop calendar

Major activity	Month	Activity details
Land preparation	May-June	Ploughing twice, harrowing once and leveling to remove excess rain water
Sowing	Onset of monsoon for rain fed crop, Sept-Oct in South India and Feb-March for irrigated crop	As per the growing situations. Seeds are sown either broadcasting or line sowing. Line sowing at 45 × 30 cm row to row and plant to plant spacing will give maximum yield
Irrigation	As per growing condition	Under irrigated condition, two irrigations immediately after sowing and at 30 days after sowing
Intercultural operations	July-Sept	Two intercultural operations are required at 25-30 and at 90 days after sowing.
Spraying	July and August	As per the occurrence of disease and pest
Harvesting	Sept-Oct for rain fed crop, Feb-March in South India and May-June for irrigated crop	The first harvest is usually done 90 days after sowing and subsequently second and third harvests at 150 and 210 days after sowing. Under rain fed condition, cutting or uprooting of plants after 4-5 months is done for harvesting
Post harvest operation	May-June	One to three days sun drying and graded in to i) large leaves, bold pods with yellowish green colour ii) large leaves, bold pods with brownish colour and iii) small leaves and broken pods
Documentation	Through out the season	All the activities from sowing to harvesting and post harvest processing should be documented



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